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Running head: SHIRT COLOUR AND THE HOME ADVANTAGE

The home advantage over the first 20 seasons of the English Premier League: Effects of shirt colour, team ability and time trends

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Abstract

This study explored the relationship between teams' home shirt colour and the magnitude of the home advantage in English professional football. Secondary aims were to explore the consistency of the home advantage over time and the relationship between the home advantage and team ability. Archival data from 7720 matches contested over the first 20 seasons of the English Premier League were analysed. The data show that teams wearing red are more successful than teams wearing other colours, and that teams are more successful in home games than in away games (home advantage index = .608). The home advantage has also remained consistent over time (1992/93 to 2011/12) and is greater in low-ability teams (teams with lower league positions) than in high-ability teams. After controlling for team ability, it was found that teams opting for red shirts in their home games did not show a greater home advantage than teams opting for other colour shirts. Two possibilities for this finding are offered: 1) shirt colour is not a contributing factor to team success, or 2) changes in psychological functioning associated with viewing or wearing red stay with team members after shirt colour has been changed. It is recommended that researchers continue to explore the effect of shirt colour on athlete and team behaviour and further explore how team ability can affect the magnitude of the home-field advantage.

Keywords: football, soccer, home advantage, red, colour

The home advantage over the first 20 seasons of the English Premier League: Effects of shirt colour, team ability and time trends

Over the past 20 years the home advantage has emerged as an important academic research paradigm in organized sport (Nevill & Holder, 1999). The home advantage, which refers to a greater success rate in home versus away competitions, is a robust phenomenon that has been consistently demonstrated in both individual (Koning, 2011; Ramchandani & Wilson, 2011) and team (Gómez & Pollard, 2011; Liardi & Carron, 2011) sport competitions. Indeed, a comprehensive meta-analysis by Jamieson (2010) that included 87 independent samples and over 260,000 games showed an overall home winning percentage of 60.4%. The most comprehensive and well-researched model of the home advantage is Courneya and Carron's (1992) feed-forward model. This model hypothesizes that game location factors feed into the psychological states of competitors, coaches and officials that, in turn, impact the behaviour of these individuals resulting in an advantage for the home team. The four game location factors are: the influence of the crowd, travel effects, location familiarity, and competition rules.

Much research has explored the contribution of these four factors to the home advantage in sport. Although findings have not always been consistent across studies, there is evidence that crowd size (Downward & Jones, 2007) and crowd noise (Nevill, Balmer, & Williams, 2002; Unkelbach & Memmert, 2010) can influence the decision-making of referees in a manner that favours the home team. There is also some evidence that performance deteriorates with greater distance travelled to competitions (Lew, Recht, & Schwartz, 1995; Ramchandani & Wilson, 2010) and when home teams move to a new stadium (Loughead, Carron, Bray, & Kim, 2003; Pollard, 2002). Taken together, research findings have shown support for three of the four factors (crowd, travel, and familiarity) contributing to the home advantage in team sport (see Carron, Loughead, & Bray, 2005). The fourth factor,

competition rules, has rarely been explored as a potential contributing factor to the home-field advantage (for an exception, see Courneya & Carron, 1990). This is because for most sports there are very few competition rules that directly favour the home team. However, one possible advantage for home teams, in terms of competition rules, is having the choice of shirt colour.

Colour not only has aesthetic value but can also communicate specific information that has direct implications for psychological functioning (Elliot & Maier, 2012). Learned associations may develop from repeated pairings of certain colours with specific information (messages, concepts, experiences) and biologically based tendencies may predispose individuals to respond to particular colours in particular ways. Elliot and Maier's (2007, 2012; Elliot, Maier, Moller, Friedman, & Meinhardt, 2007; Moller, Elliot, & Maier, 2009) colour-in-context theory predicts that *red* is associated with threat in achievement contexts. This effect could have developed through classical conditioning, for example, red is often used in performance evaluations to indicate errors or mistakes (e.g. using a red pen), and more generally in society to signal vigilance (e.g. warning signs). Alternatively, in many animal species the colour red functions as a signal of dominance or attack-readiness during aggressive interactions, and another possibility is that humans share with other primates a biologically based tendency to interpret red as a signal of danger in competitive situations (Hill & Barton, 2005; Moller et al., 2009).

In light of these hypotheses, researchers have begun to explore whether the colour red provides an advantage for competitors. Generally, studies have shown that persons or teams wearing red have a greater incidence of victory in physical contests (Attrill, Gresty, Hill, & Barton, 2008; Elliot & Aarts, 2011; Hagemann, Strauss, & Ließing, 2008; Hill & Barton, 2005; Payen et al., 2011). In addition to win/loss outcomes, studies have also explored the effect of shirt colour on person perceptions and behaviours. When facing an opponent

wearing red people display greater levels of threat (Feltman & Elliot, 2011), are less optimistic (Greenlees, Leyland, Thelwell, & Filby, 2008), and display greater avoidance behaviour (Elliot, Maier, Binser, Friedman, & Pekrun, 2009). This might suggest that viewing red on an opponent has a greater effect on psychological functioning than has wearing red oneself. Feltman and Elliot (2011) tested this possibility directly and found evidence for a bidirectional relationship: Wearing red can affect the perceptions and behaviour of both the person wearing red and the person viewing red.

In many sports, the choice of shirt colour is designated by the home team and therefore it stands to reason that teams opting for red shirts in their home games will show a greater home winning percentage than teams opting for other shirt colours. Likewise, teams that more frequently wear red shirts in their away fixtures can be expected to show a greater away winning percentage (i.e. a weaker home advantage) than teams less frequently wearing red shirts in their away fixtures. To date, almost no research has explored how competition rules (in this case having the choice of shirt colour) can favour the home team. Shirt colour represents one potential contributing factor to the home advantage in sport since home teams designate their shirt colour (away teams must wear a contrasting colour) and red shirts have been associated with a greater winning percentage in team sport competitions (Attrill et al., 2008). The purpose of this study was to explore, in a sample of professional sport teams, whether the magnitude of the home advantage is contingent on the shirt colour worn by the home team. It was hypothesized that teams contesting their home fixtures in red would show a greater home advantage than teams contesting their home fixtures in other colours.

The home advantage is generally thought to occur in response to four underlying causes (Carron et al., 2005). However, other potential (moderating) factors may also affect the magnitude of the home advantage. There is evidence from both European (Page & Page, 2007) and English (Pollard & Pollard, 2005) football competitions that the home advantage

has been in decline since the 1960s and this has generally been attributed to increased professionalism and the development of a market culture in the game (Page & Page, 2007). This study sought to explore further, using more recent data, whether the home advantage has continued to decline during the modern era, and account for any time effects in our analyses of shirt colour and the home advantage.

A second potential moderator of the home-field advantage is athlete and team ability. Bray (1999) hypothesized that low-ability teams might show a greater home advantage than high-ability teams since low-ability teams win less frequently and therefore the home advantage becomes a more formidable factor in their ability to win games. To explore this possibility, Bray (1999) analyzed the home advantage in professional ice-hockey over a 20 year period but found no evidence that lower-ability teams demonstrate a greater home advantage. A further study by Bray and colleagues (Bray, Law, & Foyle, 2003) in English professional football even demonstrated the opposite effect as teams in higher divisions (higher-ability teams) showed a greater home advantage than teams in lower divisions (lower-ability teams). As these studies did not support Bray's (1999) original hypothesis, we sought to explore further whether the home advantage differs in teams of varying ability, and account for any effect in our analyses of shirt colour and the home advantage. These relationships were explored over the first 20 seasons of the English Premier League.

Method

Procedure

Data from 7720 matches contested over the first 20 seasons of the English Premier League (1992/93 season through 2011/12 season) were obtained from the official website of the English Premier League (<http://www.premierleague.com/>). The information obtained included number of wins, draws, losses, goals scored, goals conceded and total points gained in home and away fixtures (see Table 1 for a summary of this data). A total of 46 teams have

participated in the 7720 matches under a balanced home and away schedule. Team-season served as the unit of analysis. For the 46 teams, a total of 406 team-seasons were obtained from the sample. Data on home team shirt colour over the 20 seasons were obtained from official club websites and cross-checked with online encyclopaedias (for example, <http://www.wikipedia.org/>).

Analyses

The home advantage index used in main analyses was calculated as the total points gained in home fixtures as a percentage of the total points gained in the season. This assessment method is consistent with previous studies in association football where drawn games are a frequent occurrence (Pollard & Pollard, 2005). The measure of team quality was taken as each team's finishing league position. Because away shirt colours vary considerably between- and within-seasons this study focuses on home shirt colour only. The most common home shirt colours in the English Premier League were *blue* (26.6%; 11 teams, 108 team-seasons), *red* (21.9%; 8 teams, 89 team-seasons), *white* (15.8%; 6 teams, 64 team-seasons), *blue and white* stripes (9.9%; 6 teams, 40 team-seasons), *claret* (9.1%; 3 teams, 37 team-seasons), *red and white* stripes (7.6%; 4 teams, 31 team-seasons), and *black and white* stripes (4.4%; one team, 18 seasons). Six other colours (yellow, gold, tangerine, claret and amber, blue and red, amber and black) represented a further 4.7% of home shirt colours worn (8 teams, 19 team-seasons). For coherence, analyses were run only for colours representing a relatively large proportion of team-seasons. We compared teams competing in *blue*, *red*, *white*, and a fourth grouping of *other* colours. Analyses were then re-run with teams in *red and white* stripes categorized as "red" (total sample 29.6%; 12 teams, 120 team-seasons) and teams in *blue and white* stripes categorized as "blue" (total sample 36.5%; 17 teams, 148 team-seasons). This grouping is consistent with previous research in English football (Attrill et al., 2008).

Results

All data distributions appeared normal with no obvious outliers. The data showed a clear home advantage effect with 60.77% (± 8.30) of total points being won in home games (Table 1). Teams accumulated an average of 32.06 (± 8.87) points per season in home games and an average of 20.69 (± 8.43) points per season in away games, $t(405) = 29.79$, $p < .001$, $d = 1.31$. The data also show important differences in finishing league positions between teams in different colour home shirts. Teams in red had an average league position of 6.72 (± 6.09), teams in blue had an average league position of 11.51 (± 5.56), teams in white had an average league position of 10.97 (± 4.71), and teams in other colours had an average league position of 12.32 (± 5.38), $F(3, 402) = 20.56$, $p < .001$, $\eta^2 = .13$. This effect was such that teams in red finished significantly higher than teams in blue (mean diff. = 4.79, $SE = 0.79$, $p < .001$), white (mean diff. = 4.25, $SE = 0.90$, $p < .001$) and other colours (mean diff. = 5.60, $SE = 0.74$, $p < .001$). When data were re-analysed to include striped shirts, teams in red had an average league position of 8.67 (± 6.50), teams in blue had an average league position of 11.61 (± 5.54), teams in white had an average league position of 10.97 (± 4.71), and teams in other colours had an average league position of 11.73 (± 5.70), $F(3, 402) = 7.07$, $p < .001$, $\eta^2 = .05$. This effect was such that teams in red finished significantly higher than teams in blue (mean diff. = 2.95, $SE = 0.71$, $p < .001$), white (mean diff. = 2.30, $SE = 0.89$, $p < .05$), and other colours (mean diff. = 3.06, $SE = 0.85$, $p < .01$).

Figure 1 illustrates the relationship between team ability (finishing league position) and the magnitude of the home advantage. The data demonstrate that teams with lower league finishes show a greater home advantage effect, $r^{\text{ho}}(406) = .28$, $p < .01$. Figure 2 illustrates the magnitude of the home advantage over the first 20 seasons of the English Premier League. The data demonstrate that the home advantage has remained unchanged over this time, $r^{\text{ho}}(406) = .04$, $p > .05$. Because teams in red tend to finish towards the top

end of the league table, and teams near the top end of the league table tend to show a lower home advantage, it was important to account for finishing league position (team ability) when exploring the relationship between shirt colour and the home advantage.

A unifactorial (shirt colour) between-subjects analysis of covariance was conducted on the home advantage. League position was entered as a covariate¹ and was significant, $F(1, 401) = 20.36, p < .01, \eta^2 = .05$. The data showed that teams in red had an adjusted mean home advantage of 60.27 ($SE = 0.89$), teams in blue had an adjusted mean home advantage of 60.44 ($SE = 0.77$), teams in white had an adjusted mean home advantage of 63.27 ($SE = 1.00$), and teams in other colours had an adjusted mean home advantage of 62.16 ($SE = 0.67$), $F(3, 401) = 2.61, p = .051, \eta^2 = .02$ (estimated power = .64). Pairwise comparisons of group means revealed no significant differences between any two colours. When data were re-analysed with the inclusion of striped shirts league position was again significant, $F(1, 401) = 28.58, p < .01, \eta^2 = .07$. No significant difference in the home advantage was observed between colours – teams in red had an adjusted mean home advantage of 61.53 ($SE = 0.74$), teams in blue had an adjusted mean home advantage of 60.64 ($SE = 0.66$), teams in white had an adjusted mean home advantage of 63.26 ($SE = 1.00$), and teams in other colours had an adjusted mean home advantage of 61.46 ($SE = 0.93$), $F(3, 401) = 1.59, p > .05, \eta^2 = .01$ (estimated power = .42).

Discussion

This study sought to explore the magnitude of the home advantage across playing seasons, teams of varying ability, and teams contesting in different colour shirts. The finding that teams opting for red shirts have significantly higher league finishing positions is consistent with the research conducted by Attrill et al. (2008). The magnitude of the home advantage is also consistent with effects shown in the recent meta-analysis by Jamieson

¹ Season was not entered as a covariate as it was unrelated to the home advantage (Figure 2)

(2010). Our study demonstrates that the home advantage has not continued to decline during the modern era. This finding compliments the research of Page and Page (2007) and Pollard and Pollard (2005) that demonstrated a declining home advantage effect from the 1960s into the early twenty-first century. This effect appears to have subsided in recent years and is likely a resulting factor of the continued professionalism and market culture in the game. Our findings also demonstrate that teams finishing towards the lower end of the league table show a greater home advantage than teams finishing towards the higher end of the league table. This finding conflicts with those of Bray (1999) and Bray et al. (2003), and support Bray's (1999) original hypothesis that low-ability teams will show a greater home advantage than high-ability teams.

The hypothesis that teams opting for red shirts in home games would show a greater home advantage than teams opting for other colour shirts was not supported. Although a borderline significant effect was shown in the original analysis, the effect was not in the direction predicted and with the low observed power and small effect size this finding is negligible. Also, when teams in blue and white stripes were grouped with teams in blue and teams in red and white stripes were grouped with teams in red (similar to the groupings used by Attrill et al., 2008) no significant effect was observed. Therefore, even though red shirt colour is associated with greater success in sport competitions (Attrill et al., 2008; Elliot & Aarts, 2011; Hagemann et al., 2008; Hill & Barton, 2005; Payen et al., 2011) the home advantage is no greater for teams opting for red shirts in home games than for teams opting for other colour shirts.

Our findings show that teams contesting their home games in red are more successful than teams contesting their home games in other colours (as indexed by finishing league position). However, surprisingly these teams are no more successful when they are wearing red than when they are not wearing red (as indexed by similar home advantage effects for

teams in red, blue, white, and other colours). If teams contesting their home games in red are no more successful in home games relative to away games (than teams contesting their home games in other colours) then we are left with the possibility that shirt colour is not a contributing factor to team success. Indeed, the evidence for the red win effect is less compelling in teams sports than in individual sports (García-Rubio, Picazo-Tadeo, & González-Gómez, 2011; Kocher & Sutter, 2008) and it is possible that the higher league positions for teams in red represents a false positive finding (a Type I error) – teams in red just happen to be more successful. The other possibility is that changes in psychological functioning associated with viewing or wearing red stay with team members after shirt colour has been changed. In English professional football, teams are known for wearing particular colours and it is possible that team members become conditioned to associate certain colours with certain teams – the team then becomes the catalyst for greater levels of threat (Feltman & Elliot, 2011) or pessimism (Greenlees et al., 2008) regardless of the colour they happen to be wearing on the day of competition. Thus, the red win effect could potentially stay with teams into their away games even though they are not wearing red in these games. This would potentially nullify any increase in the home advantage for teams contesting their home games in red. An interesting area for future research, therefore, would be to explore how teams contesting their home games in red fare against other teams that contest their home games in red.

There are some potential limitations in our analyses that should be addressed in order to place the findings firmly in context. In some instances it is possible for teams to wear their home shirt colours in away fixtures. This occurs when the away shirt colour is not sufficiently different from the home teams' shirt colour and the away team does not have an alternative (third kit). In the current analysis it was not possible to control for this effect and therefore we cannot be certain that potential differences (in the home advantage) between

shirt colours were not attenuated because of teams contesting their home and away fixtures in the same colour. Nevertheless, we can be confident that all home games (100%) were contested in home shirt colours and provided the home shirt colour is worn less frequently in away games than in home games the hypothesised effects should still materialise.

Nevertheless, we encourage researchers to identify methods that help control for this limitation in future research designs. A second limitation pertains to the generalisability of findings beyond the current population. In sports where it might be beneficial to not be seen easily by an opponent (e.g. tennis, badminton) the psychological advantage that might be gained from wearing red may be nullified by the disadvantage of greater visibility (cf. Sorokowski & Szmajke, 2011). Accordingly, future research is required to identify whether the current study findings transfer to other performance related domains.

The findings of the current study compliment the extant literature in several ways. First, we reinforce findings from past research demonstrating that teams wearing red are more successful than teams wearing other colours, and that teams are more successful in home games than in away games. Second, this study builds on past research exploring time trends and show that the home advantage has remained relatively consistent in recent years. Third, this study has demonstrated that teams of lower ability show a greater home advantage than teams of higher ability, and finally, that the home advantage is unrelated to the shirt colour worn by home teams. The findings of this study seem to confirm past suggestions that competition rules (in this case having the choice of shirt colour) are relatively unimportant for the home advantage in team sport (Carron et al., 2005; Nevill & Holder, 1999) and from a practical perspective show that opting for red shirts will not improve a team's home-away success ratio. We recommend that researchers continue to explore the effect of shirt colour in team sports other than association football and further explore how team ability can affect the magnitude of the home-field advantage.

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Figure 1: Home advantage as a function of finishing league position

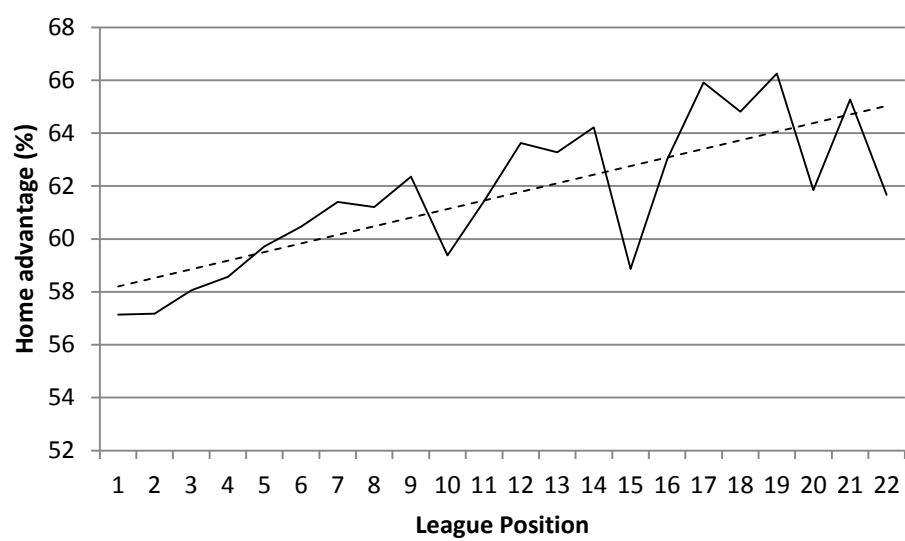


Figure 2: Home advantage over the first 20 seasons of the English Premier League

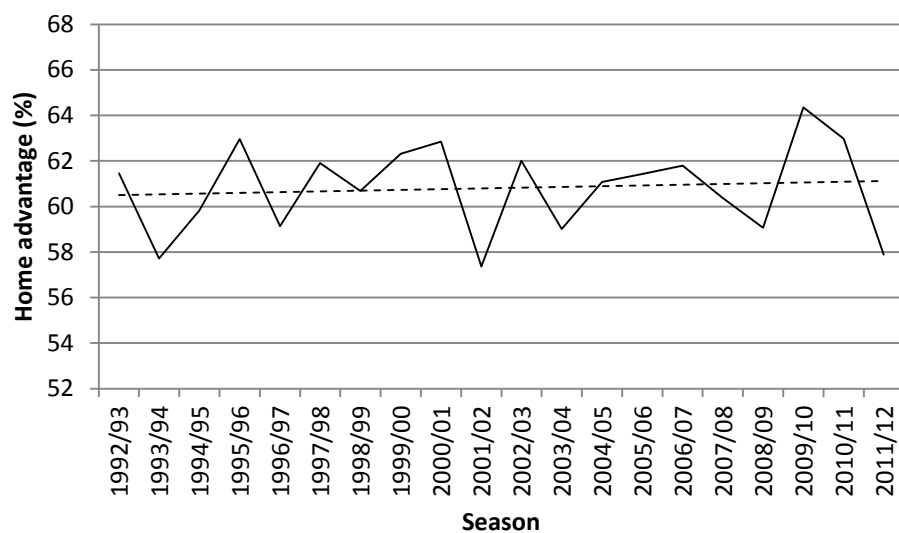


Table 1: *Occurrence of the home advantage across Premier League seasons.*

Season	Home wins	Away wins	Home goals scored	Away goals scored	Home points	Away points	Home advantage
1992/1993	214	118	723	499	772	484	61.46%
1993/1994	192	128	663	532	718	526	57.72%
1994/1995	205	123	697	498	749	503	59.82%
1995/1996	186	96	580	408	656	386	62.96%
1996/1997	162	99	559	411	602	416	59.14%
1997/1998	184	101	592	427	647	398	61.91%
1998/1999	169	96	553	406	622	403	60.68%
1999/2000	187	101	635	425	653	395	62.31%
2000/2001	184	95	587	405	653	386	62.85%
2001/2002	165	114	557	444	596	443	57.36%
2002/2003	187	103	570	430	651	399	62.00%
2003/2004	167	105	572	440	609	423	59.01%
2004/2005	173	97	570	405	629	401	61.07%
2005/2006	192	111	555	389	653	410	61.43%
2006/2007	182	100	552	379	644	398	61.80%
2007/2008	176	104	581	421	628	412	60.38%
2008/2009	173	110	532	410	616	427	59.06%
2009/2010	193	91	645	408	666	369	64.35%
2010/2011	179	90	617	446	648	381	62.97%
2011/2012	171	116	604	462	606	441	57.88%
Total	3641	2098	11944	8645	13018	8401	60.78%

Note: Home victories are synonymous with away defeats, away wins are synonymous with home defeats, home goals scored are synonymous with away goals conceded, and away goals scored are synonymous with home goals conceded. The home advantage index was calculated from points scored at home as a percentage of the total points scored. 420 games were contested per season up to and including the 1994/1995 season and 380 games per season thereafter. Points accumulated are 3 for a win, 1 for a draw and 0 for a loss.